

# *Harmony Road Self Storage*

J.O. SGL 07-113

July 21, 2015

## ***PRELIMINARY STORM DETENTION AND WATER QUALITY CALCULATIONS***

### **SISUL ENGINEERING**

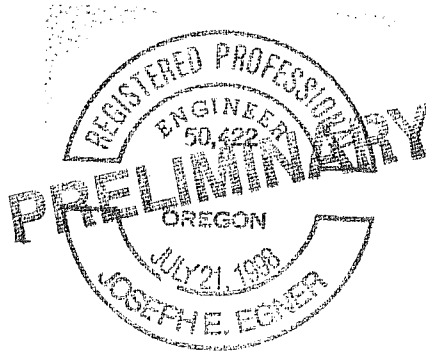
*A Division of Sisul Enterprises, Inc.*

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# Harmony Road Self Storage (SGL 07-113)

## DESIGN CONDITIONS:

This storm detention system is designed to limit the increase in runoff due to development of this property, to a level below that required by The City of Milwaukie. We have used the City of Portland's stormwater manual to design a system meets the required treatment and then detains the larger events to at or below undeveloped releases.

This project will be broken into three basins to accomplish this. The first basin (Basin A) will consist of the roof area for Building 1. The second basin (Basin B) will consist of the pavement and parking lot to the south of the creek. The third basin (Basin c) will consist of the roof of building 2 and the pavement and parking lot to the north of the creek. Because of the sites area restrictions, the steepness of the site and poor infiltrating soils we cannot use infiltration facilities to deal with the runoff from theses areas. We will use the City of Portland's PAC calculator to size flow through facilities for each of these basins. The PAC calculator looks only at the impervious areas being ran to a facility. To check the detention of the facility we will run the PAC calculator on the basins area with a CN number representing a pervious surface. This will ignore the existing structures that are on site but will give a release below the existing

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## AREAS:

Total Site Area = 2.87 acres

## DEVELOPED SITE:

- Basin A** (See attached site plan):
  - Pervious Area = **0.68 acres (undeveloped site)**
  - Impervious Area = **0.68 acres (developed site)**
- Basin B** (See attached site plan):
  - Pervious Area = **0.52 acres (undeveloped site)**
  - Impervious Area = **0.52 acres (developed site)**
- Basin C** (See attached site plan):
  - Pervious Area = **0.60 acres (undeveloped site)**
  - Impervious Area = **0.60 acres (developed site)**

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## SOIL:

Per Clackamas County Soil Survey, most of the site is a Wapato silty clay loam. The soil is a classified in hydrologic group 'D'. (see attached sheet)

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## CURVE NUMBERS: (see attached sheet)

### Undeveloped Basins

Pervious Surface (pasture) =====> 89

### Developed Basins

Impervious (Pavement and Roofs) =====> 98

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**STORM RUNOFF DETENTION DESIGN:**

We will size flow thru planters for each basin to treat the required surfaces and reduce the flows to or below the undeveloped flow rates for each basin.

**BASIN A:**

Per the attached PAC Sheet for Basin A (Aun-undeveloped, Adev-developed) gives us the undeveloped flows and the developed flows for basin A.

**BASIN A FLOW RATES:**

STORM EVENT	Undeveloped Area Flows	Developed Area Flows	Planter Release Flow Rates
2yr	<b>0.227 cfs</b>	<b>0.416 cfs</b>	<b>0.053 cfs</b>
5yr	<b>0.308 cfs</b>	<b>0.508 cfs</b>	<b>0.085 cfs</b>
10yr	<b>0.391 cfs</b>	<b>0.600 cfs</b>	<b>0.121 cfs</b>
25yr	<b>0.476 cfs</b>	<b>0.691 cfs</b>	<b>0.355 cfs</b>

This shows that using a flow through planter with a storage depth of 24-inchs and a surface area of 1,150-SqFt will provide the required treatment and detention requirements for this basin. This shows the planter will reduce the developed flow release rates to be at or below the undeveloped flow rates.

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**BASIN B:**

Per the attached PAC Sheet for Basin B (Bun-undeveloped, Bdev-developed) gives us the undeveloped flows and the developed flows for basin B.

**BASIN A FLOW RATES:**

STORM EVENT	Undeveloped Area Flows	Developed Area Flows	Planter Release Flow Rates
2yr	<b>0.175 cfs</b>	<b>0.320 cfs</b>	<b>0.041 cfs</b>
5yr	<b>0.237 cfs</b>	<b>0.390 cfs</b>	<b>0.065 cfs</b>
10yr	<b>0.301 cfs</b>	<b>0.461 cfs</b>	<b>0.093 cfs</b>
25yr	<b>0.365 cfs</b>	<b>0.531 cfs</b>	<b>0.273 cfs</b>

This shows that using a flow through planter with a storage depth of 24-inchs and a surface area of 885-SqFt will provide the required treatment and detention requirements for this basin. This shows the planter will reduce the developed flow release rates to be at or below the undeveloped flow rates.

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**BASIN C:**

Per the attached PAC Sheet for Basin C (Cun-undeveloped, Cdev-developed) gives us the undeveloped flows and the developed flows for basin C.

**BASIN A FLOW RATES:**

STORM EVENT	Undeveloped Area Flows	Developed Area Flows	Planter Release Flow Rates
2yr	<b>0.202 cfs</b>	<b>0.369 cfs</b>	<b>0.047 cfs</b>
5yr	<b>0.273 cfs</b>	<b>0.451 cfs</b>	<b>0.067 cfs</b>
10yr	<b>0.347 cfs</b>	<b>0.532 cfs</b>	<b>0.108 cfs</b>
25yr	<b>0.422 cfs</b>	<b>0.613 cfs</b>	<b>0.315 cfs</b>

This shows that using a flow through planter with a storage depth of 24-inchs and a surface area of 1,020-SqFt will provide the required treatment and detention requirements for this basin. This shows the planter will reduce the developed flow release rates to be at or below the undeveloped flow rates.

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**SUMMARY:**

This storm detention system is designed to limit the increase in runoff due to development of this property, to a level below that required by the City of Milwaukie. We have shown that by the use of flow through basins the water quality event is met for each basin and the developed storm events will be released at rates less than the corresponding undeveloped sites releases. We believe that we have shown the City of Milwaukie's stormwater requirements for water quality and quantity can be met by the use of the flow through planters.

# **SUPPORTING DOCUMENTS:**

TABLE 3.5.2B SCS WESTERN WASHINGTON RUNOFF CURVE NUMBERS

SCS WESTERN WASHINGTON RUNOFF CURVE NUMBERS (Published by SCS in 1982)					
Runoff curve numbers for selected agricultural, suburban and urban land use for Type 1A rainfall distribution, 24-hour storm duration.					
LAND USE DESCRIPTION		CURVE NUMBERS BY HYDROLOGIC SOIL GROUP			
		A	B	C	D
Cultivated land(1):	winter condition	86	91	94	95
Mountain open areas:	low growing brush and grasslands	74	82	89	92
Meadow or pasture:		65	78	85	89
Wood or forest land:	undisturbed or older second growth	42	64	76	81
Wood or forest land:	young second growth or brush	55	72	81	86
Orchard:	with cover crop	81	88	92	94
Open spaces, lawns, parks, golf courses, cemeteries, landscaping.					
good condition:	grass cover on 75% or more of the area	68	80	86	90
fair condition:	grass cover on 50% to 75% of the area	77	85	90	92
Gravel roads and parking lots		76	85	89	91
Dirt roads and parking lots		72	82	87	89
Impervious surfaces, pavement, roofs, etc.		98	98	98	98
Open water bodies:	lakes, wetlands, ponds, etc.	100	100	100	100
Single Family Residential (2)					
Dwelling Unit/Gross Acre	% Impervious (3)				
1.0 DU/GA	15				
1.5 DU/GA	20				
2.0 DU/GA	25				
2.5 DU/GA	30				
3.0 DU/GA	34				
3.5 DU/GA	38				
4.0 DU/GA	42				
4.5 DU/GA	46				
5.0 DU/GA	48				
5.5 DU/GA	50				
6.0 DU/GA	52				
6.5 DU/GA	54				
7.0 DU/GA	56				
Planned unit developments, condominiums, apartments, commercial business and industrial areas.	% impervious must be computed				Separate curve number shall be selected for pervious and impervious portion of the site or basin

- (1) For a more detailed description of agricultural land use curve numbers refer to National Engineering Handbook, Section 4, Hydrology, Chapter 9, August 1972.
- (2) Assumes roof and driveway runoff is directed into street/storm system.
- (3) The remaining pervious areas (lawn) are considered to be in good condition for these curve numbers.



TABLE 14.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth Ft	Kind	Months	Depth In	Hardness	Uncoated steel	Concrete
69*. Pits											
70B, 70C, 70D----- Powell	C	None-----	---	---	1.5-2.0	Perched	Dec-Apr	>60	---	Moderate	Moderate.
71A, 71B, 71C----- Quatama	C	None-----	---	---	2.0-3.0	Apparent	Dec-Apr	>60	---	Moderate	Moderate.
72D, 72E----- Ritner	C	None-----	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
73*. Riverwash											
74F*: Rock outcrop. Cryochrepts.											
75*. Rubble land											
76B, 76C, 77B----- Salem	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
78B, 78C, 78D, 78E----- Saum	C	None-----	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate.
79B, 79C----- Sawtell	C	None-----	---	---	1.5-3.0	Perched	Nov-Apr	>60	---	Moderate	Moderate.
80B, 80C, 80D, 80E----- Springwater	C	None-----	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate.
81D*, 81E*: Talapus-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Lastance-----	B	None-----	---	---	>6.0	---	---	>60	---	High-----	High.
82*. Urban land											
83, 84----- Wapato	D	Frequent---	Brief-----	Dec-Feb	+5-1.0	Apparent	Dec-Feb	>60	---	Moderate	Moderate.
85D*: Wilhoit-----	B	None-----	---	---	>6.0	---	---	40-60	Soft	Moderate	Moderate.
Zygore-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
86A, 86B, 86C, 87A----- Willamette	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
88A, 88B----- Willamette	C	None-----	---	---	2.5-3.5	Apparent	Dec-Mar	>60	---	Moderate	Moderate.
89D----- Witzel	D	None-----	---	---	>6.0	---	---	12-20	Hard	Moderate	Moderate.
90F*: Witzel-----	D	None-----	---	---	>6.0	---	---	12-20	Hard	Moderate	Moderate.
Rock outcrop.											
91A, 91B, 91C----- Woodburn	C	None-----	---	---	2.0-3.0	Perched	Dec-Apr	>60	---	Moderate	Moderate.

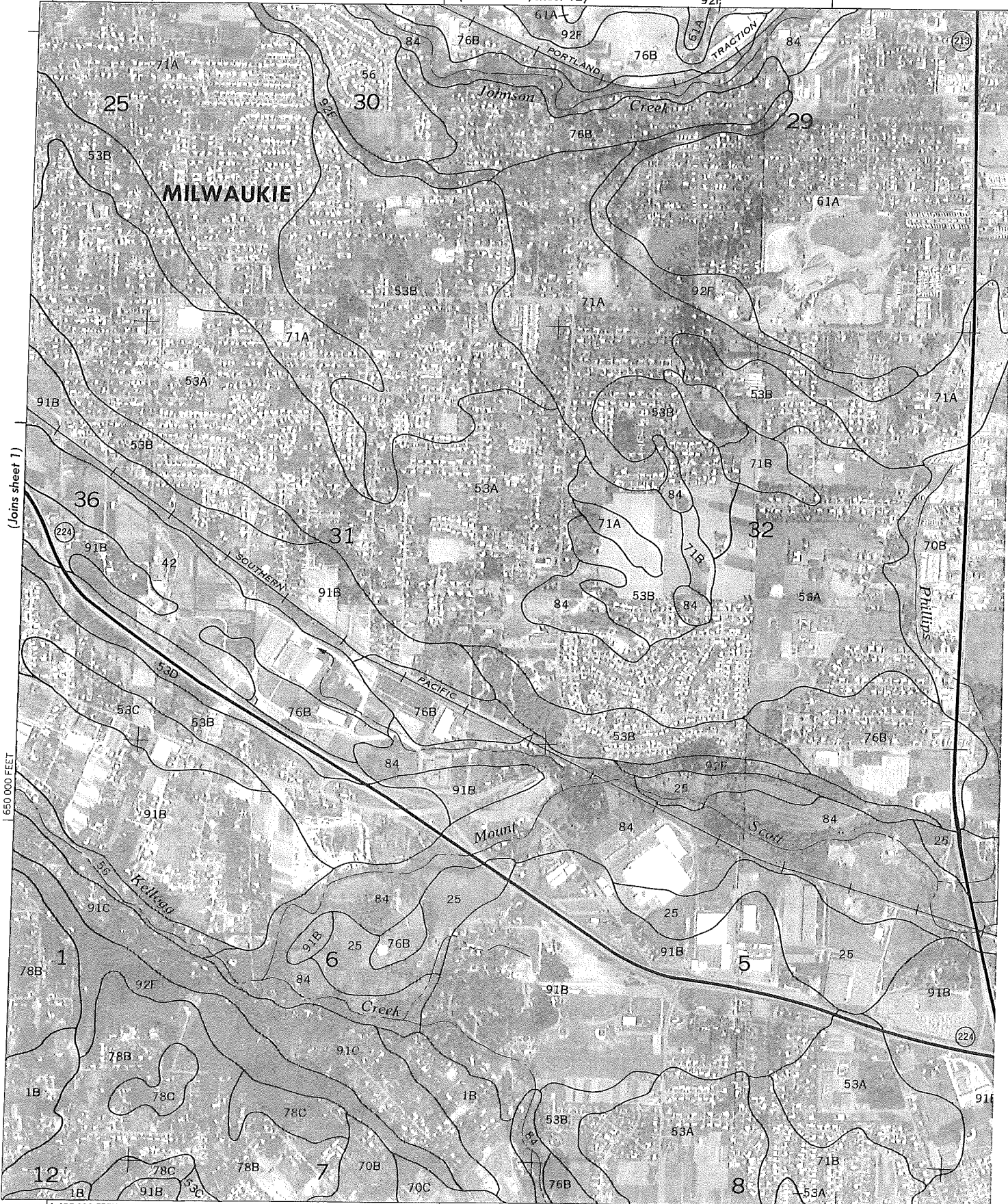
See footnote at end of table.



R. 1 E. | R. 2 E.

(Joins inset B, sheet 12)

92F



(Joins sheet 1)

1:650,000 FEET

1:1,455,000 FEET

(Joins sheet 7)



3/4



BUILDING 2  
13,840 SQ.FT.

TOTAL BASIN 'C'  
26,130 SQ.FT.

PARKING LOT  
12,290 SQ.FT.

PARKING LOT  
BASIN 'B'  
22,635 Q.FT.

BUILDING 1  
BASIN 'A'  
29,475 SQ.FT.



# Presumptive Approach Calculator ver. 1.2

Catchment Data

Project Name: Harmony Road Self Stgorage  
 Project Address: Harmony Road  
Milwaukie, OR  
 Designer: Joe Egner  
 Company: Sisul Engineering

Catchment ID: Bun

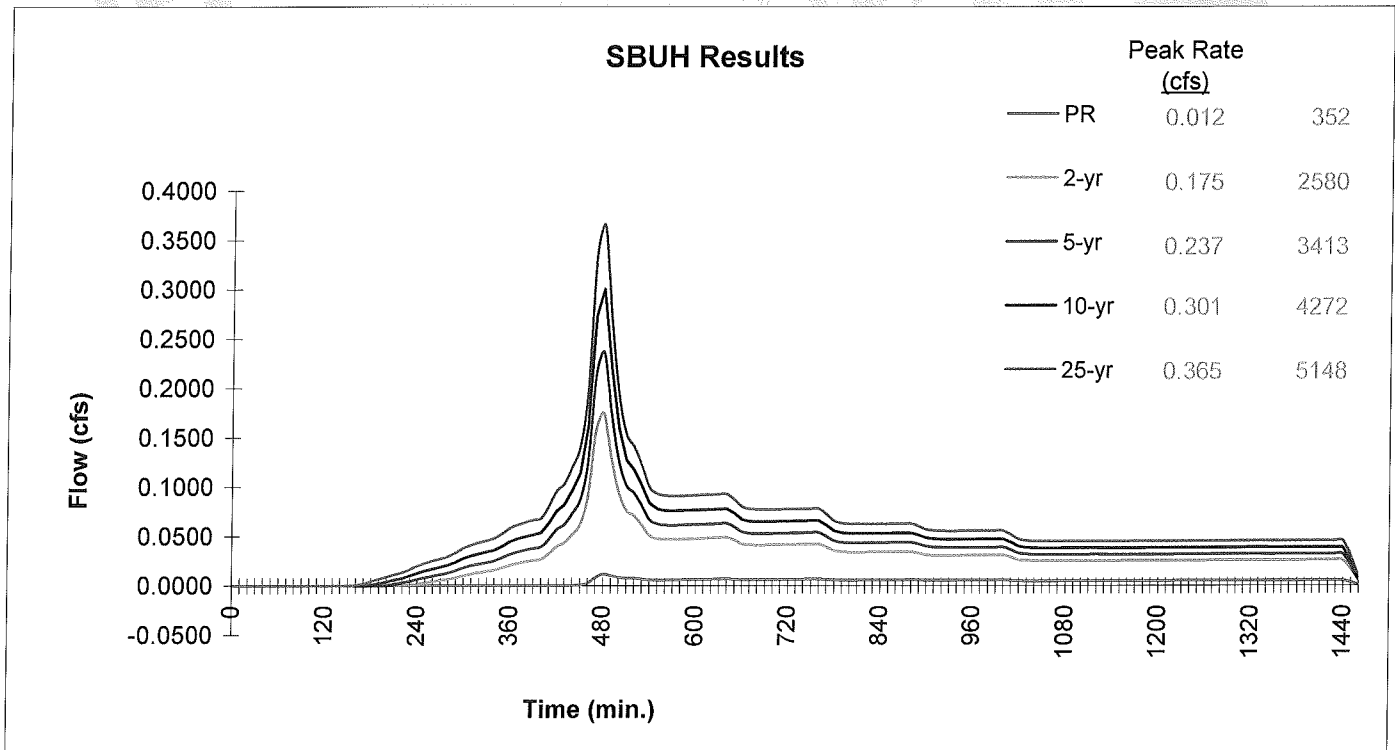
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Permit Number: 0

Run Time 7/22/2015 2:57:28 PM

Drainage Catchment Information	
Catchment ID	Bun
<b>Catchment Area</b>	
Impervious Area	22,635 SF
Impervious Area	0.52 ac
Impervious Area Curve Number, $CN_{imp}$	89
Time of Concentration, $T_c$ , minutes	10 min.
Site Soils & Infiltration Testing Data	
Infiltration Testing Procedure:	Open Pit Falling Head
Native Soil Field Tested Infiltration Rate ( $I_{test}$ ):	4 in/hr
Bottom of Facility Meets Required Separation From High Groundwater Per BES SWMM Section 1.4:	Yes
Correction Factor Component	
$CF_{test}$ (ranges from 1 to 3)	2
Design Infiltration Rates	
$I_{dsgn}$ for Native ( $I_{test} / CF_{test}$ ):	2.00 in/hr
$I_{dsgn}$ for Imported Growing Medium:	2.00 in/hr

**Execute SBUH Calculations**





# Presumptive Approach Calculator ver. 1.2

Catchment Data

Project Name: Harmony Road Self Storage  
 Project Address: Harmony Road  
Milwaukie, OR  
 Designer: Joe Egner  
 Company: Sisul Engineering

Catchment ID: Bdev

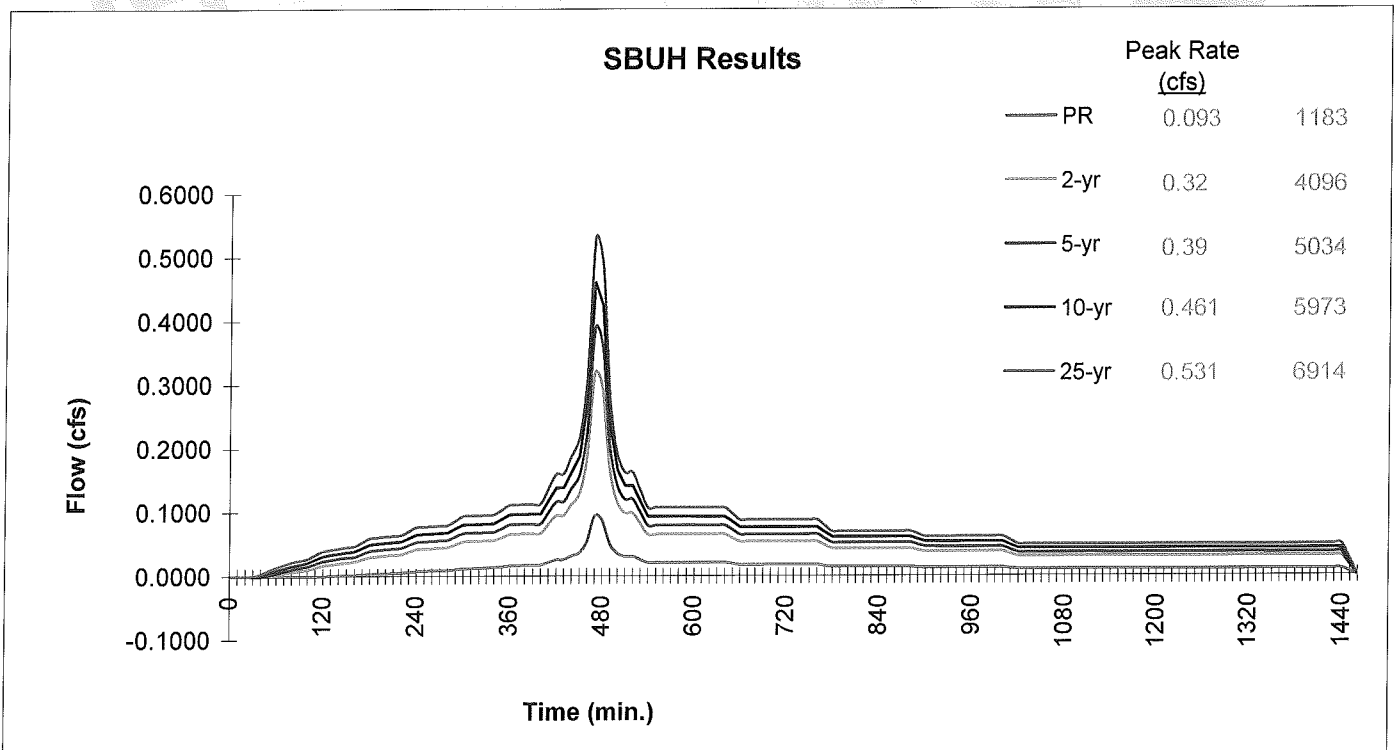
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Permit Number: 0

Run Time 7/22/2015 3:02:10 PM

Drainage Catchment Information	
Catchment ID	Bdev
<b>Catchment Area</b>	
Impervious Area	22,635 SF
Impervious Area	0.52 ac
Impervious Area Curve Number, $CN_{imp}$	98
Time of Concentration, $T_c$ , minutes	5 min.
Site Soils & Infiltration Testing Data	
Infiltration Testing Procedure:	Open Pit Falling Head
Native Soil Field Tested Infiltration Rate ( $I_{test}$ ):	4 in/hr
Bottom of Facility Meets Required Separation From High Groundwater Per BES SWMM Section 1.4:	Yes
Correction Factor Component	
$CF_{test}$ (ranges from 1 to 3)	2
Design Infiltration Rates	
$I_{dsgn}$ for Native ( $I_{test} / CF_{test}$ ):	2.00 in/hr
$I_{dsgn}$ for Imported Growing Medium:	2.00 in/hr

**Execute SBUH Calculations**





**Presumptive Approach Calculator ver. 1.2**

Catchment ID: **Bdev**

Run Time 7/22/2015 3:02:10 PM

Project Name: Harmony Road Self Stgorage

Catchment ID: Bdev

Date: 7/21/2015

**Instructions:**

1. Identify which Stormwater Hierarchy Category the facility.
2. Select Facility Type.
3. Identify facility shape of surface facility to more accurately estimate surface volume, except for Swales and sloped planters that use the PAC Sloped Facility Worksheet to enter data.
4. Select type of facility configuration.
5. Complete data entry for all highlighted cells.

Catchment facility will meet Hierarchy Category: 4

**Goal Summary:**

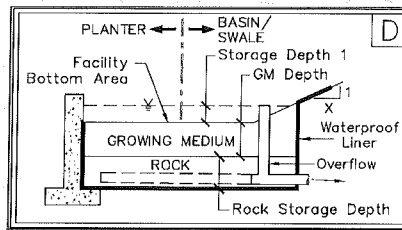
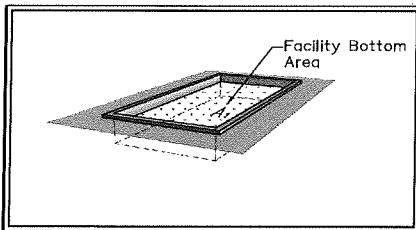
Hierarchy Category	SWMM Requirement	RESULTS box below needs to display...	
		Pollution Reduction as a	10-yr (aka disposal) as a
4	Off-site flow to a combined sewer.	PASS	N/A

Facility Type = Planter (Flat)



Facility Shape: Rectangle/Square

Facility Configuration: D



<b>Calculation Guide</b>
Max. Rock Stor.
Bottom Area
<b>885 SF</b>

**DATA FOR ABOVE GRADE STORAGE COMPONENT**

Facility Bottom Area = 885 sf  
 Bottom Width = 20.0 ft  
 Facility Side Slope = 0 to 1  
 Storage Depth 1 = 24 in  
 Growing Medium Depth = 18 in  
 Freeboard Depth = N/A in

**BELOW GRADE STORAGE**

<Warning

Surface Capacity at Depth 1 = 1,770 cf  
 GM Design Infiltration Rate = 2.00 in/hr  
 Infiltration Capacity = 0.041 cfs

Rock Storage Capacity = \_\_\_\_\_ cf  
 Native Design Infiltration Rate = \_\_\_\_\_ in/hr  
 Infiltration Capacity = \_\_\_\_\_ cfs

RESULTS		Overflow Volume			
Pollution Reduction	<b>PASS</b>	0 CF	4%	Surf. Cap. Used	Run PAC
Output File					
Peak cfs	<u>2-yr</u>	<u>5-yr</u>	<u>10-yr</u>	<u>25-yr</u>	
	0.041	0.058	0.093	0.273	

FACILITY FACTS	
Total Facility Area Including Freeboard =	<b>885 SF</b>
Sizing Ratio (Total Facility Area / Catchment Area) =	<b>0.039</b>



# Presumptive Approach Calculator ver. 1.2

Catchment Data

Project Name: Harmony Road Self Stgorage  
 Project Address: Harmony Road  
Milwaukie, OR  
 Designer: Joe Egner  
 Company: Sisul Engineering

Catchment ID: Cun

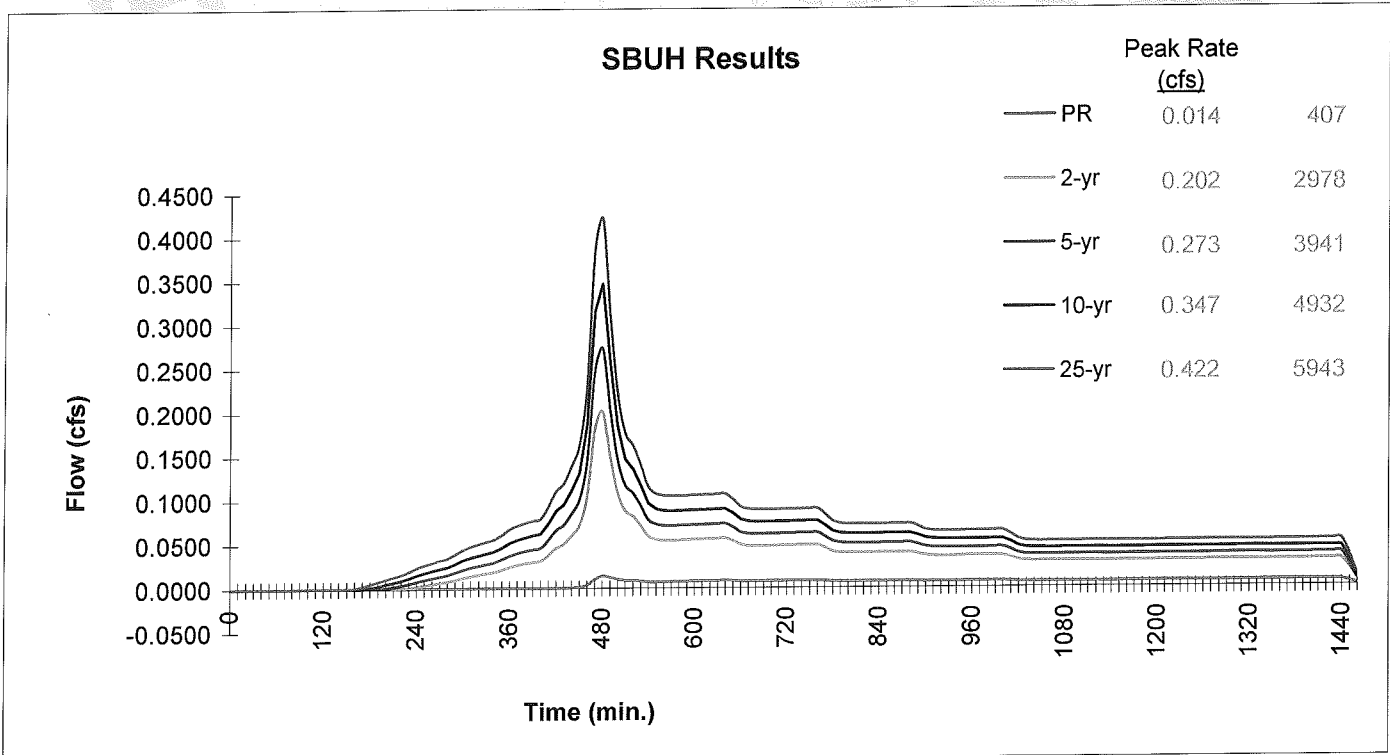
Date: 07/21/15

Permit Number: 0

Run Time 7/22/2015 3:10:23 PM

Drainage Catchment Information	
Catchment ID	Cun
<b>Catchment Area</b>	
Impervious Area	26,130 SF
Impervious Area	0.60 ac
Impervious Area Curve Number, $CN_{imp}$	89
Time of Concentration, $T_c$ , minutes	10 min.
Site Soils & Infiltration Testing Data	
Infiltration Testing Procedure:	Open Pit Falling Head
Native Soil Field Tested Infiltration Rate ( $I_{test}$ ):	2 in/hr
Bottom of Facility Meets Required Separation From High Groundwater Per BES SWMM Section 1.4:	Yes
Correction Factor Component	
$CF_{test}$ (ranges from 1 to 3)	2
Design Infiltration Rates	
$I_{dsgn}$ for Native ( $I_{test} / CF_{test}$ ):	1.00 in/hr
$I_{dsgn}$ for Imported Growing Medium:	2.00 in/hr

**Execute SBUH Calculations**





# Presumptive Approach Calculator ver. 1.2

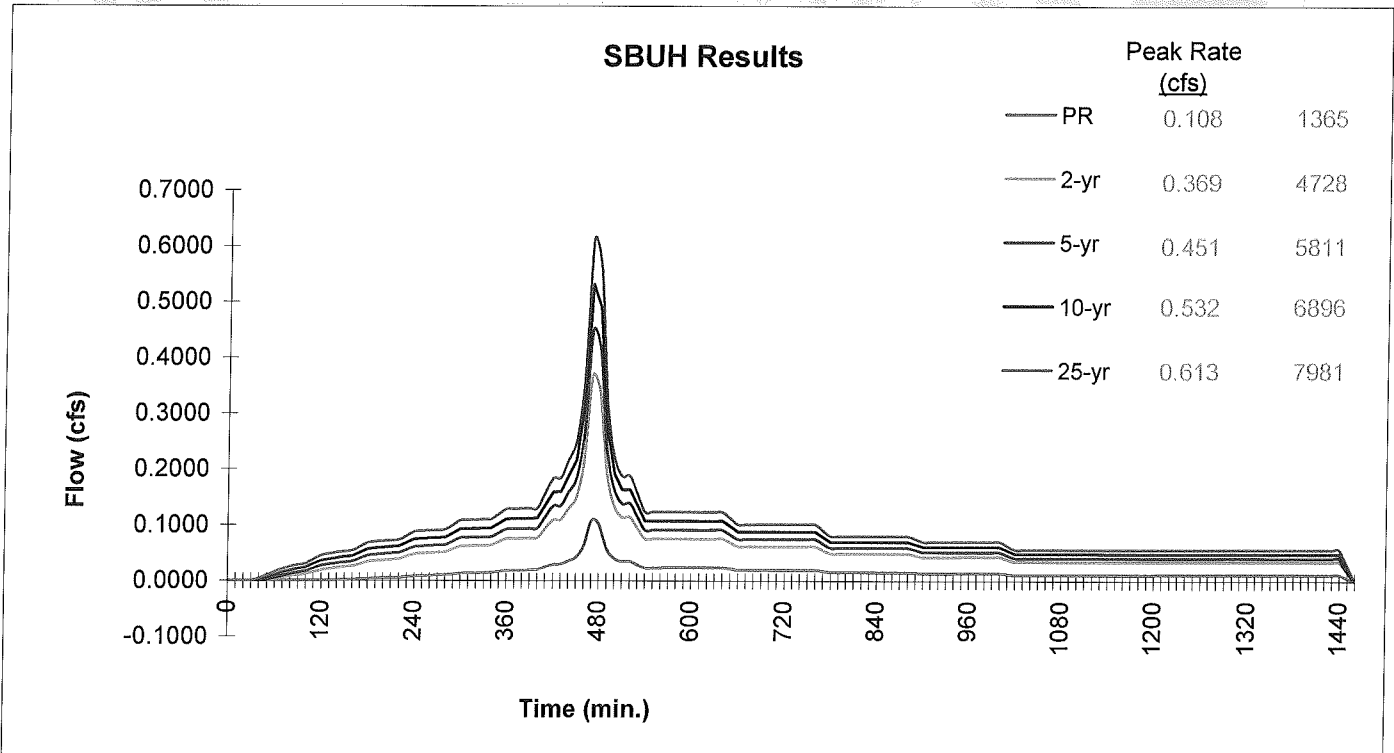
Catchment Data

Project Name: Harmony Road Self Storage  
 Project Address: Harmony Road  
Milwaukie, OR  
 Designer: Joe Egner  
 Company: Sisul Engineering

Catchment ID: Cdev  
 Date: 07/21/15  
 Permit Number: 0  
 Run Time 7/22/2015 3:10:23 PM

Drainage Catchment Information	
Catchment ID	Cdev
<b>Catchment Area</b>	
Impervious Area	26,130 SF
Impervious Area	0.60 ac
Impervious Area Curve Number, $CN_{imp}$	98
Time of Concentration, $T_c$ , minutes	5 min.
Site Soils & Infiltration Testing Data	
Infiltration Testing Procedure:	Open Pit Falling Head
Native Soil Field Tested Infiltration Rate ( $I_{test}$ ):	2 in/hr
Bottom of Facility Meets Required Separation From High Groundwater Per BES SWMM Section 1.4:	Yes
Correction Factor Component	
$CF_{test}$ (ranges from 1 to 3)	2
Design Infiltration Rates	
$I_{dsgn}$ for Native ( $I_{test} / CF_{test}$ ):	1.00 in/hr
$I_{dsgn}$ for Imported Growing Medium:	2.00 in/hr

**Execute SBUH Calculations**





**Presumptive Approach Calculator ver. 1.2**

Catchment ID: **Cdev**

Run Time: 7/22/2015 3:16:16 PM

Project Name: Harmony Road Self Storage

Catchment ID: Cdev

Date: 7/21/2015

**Instructions:**

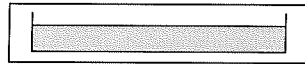
1. Identify which Stormwater Hierarchy Category the facility.
2. Select Facility Type.
3. Identify facility shape of surface facility to more accurately estimate surface volume, except for Swales and sloped planters that use the PAC Sloped Facility Worksheet to enter data.
4. Select type of facility configuration.
5. Complete data entry for all highlighted cells.

Catchment facility will meet Hierarchy Category: 4

**Goal Summary:**

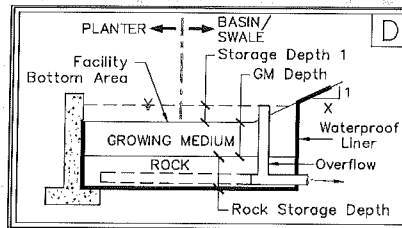
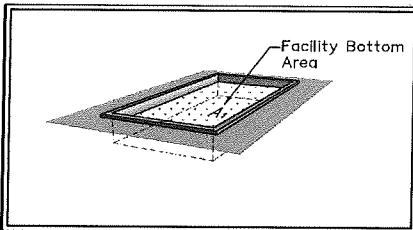
Hierarchy Category	SWMM Requirement	RESULTS box below needs to display...	
		Pollution Reduction as a	10-yr (aka disposal) as a
4	Off-site flow to a combined sewer.	PASS	N/A

Facility Type = Planter (Flat)



Facility Shape: Rectangle/Square

Facility Configuration: D



<b>Calculation Guide</b>
Max. Rock Stor. Bottom Area
<b>1,020 SF</b>

**DATA FOR ABOVE GRADE STORAGE COMPONENT**

Facility Bottom Area = 1,020 sf  
 Bottom Width = 20.0 ft  
 Facility Side Slope = 0 to 1  
 Storage Depth 1 = 24 in  
 Growing Medium Depth = 18 in  
 Freeboard Depth = N/A in

**BELOW GRADE STORAGE**

<Warning

Surface Capacity at Depth 1 = 2,040 cf  
 GM Design Infiltration Rate = 2.00 in/hr  
 Infiltration Capacity = 0.047 cfs

Rock Storage Capacity = \_\_\_\_\_ cf  
 Native Design Infiltration Rate = \_\_\_\_\_ in/hr  
 Infiltration Capacity = \_\_\_\_\_ cfs

<b>RESULTS</b>	Overflow Volume			
Pollution Reduction	<b>PASS</b>	0 CF	4% Surf. Cap. Used	Run PAC
Output File				
	<b>2-yr</b>	<b>5-yr</b>	<b>10-yr</b>	<b>25-yr</b>
Peak cfs	0.047	0.067	0.108	0.315

<b>FACILITY FACTS</b>
Total Facility Area Including Freeboard = <b>1,020 SF</b>
Sizing Ratio (Total Facility Area / Catchment Area) = <b>0.039</b>